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| **DIT UNIVERSITY, DEHRADUN**   |  |  | | --- | --- | | **B.TECH (CSE)** | **: END TERM EXAMINATION, ODD SEM 2023-24 (SEM V/VII)** | | | | | | | | | | | | | |
| **Roll No.** |  |  |  |  |  |  |  |  |  |  |  |  |
| **Machine Learning /Statistical Machine Learning** | | | | | | | | | | | | |

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| **Time: 3 Hours** | **Total Marks: 100** |
| **Note: All questions are compulsory. No student is allowed to leave the examination hall before the completion of the exam.**  **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**   |  |  |  | | --- | --- | --- | | **Q.1)** | **Attempt all Parts :** | | |  | (a) | Explain the concept of Principal Component Analysis (PCA) and its primary objective in dimensionality reduction. | |  | (b) | Discuss the history of the Perceptron and its significance in the development of artificial neural networks. | |  | (c) | Describe the bias-variance trade-off in machine learning and discuss the impact of trade-off on model performance? | |  | (d) | List out five applications of machine learning and explain each in brief. | |  |  | **[4 x 5= 20]** | |  | | | | **Q.2)** | **Attempt all Parts :** | | |  | (a) | Describe the difference between supervised and unsupervised feature selection methods. Provide examples of each. | |  | (b) | What is the curse of dimensionality, and how does it impact machine learning algorithms? | |  | (c) | Compare and contrast hierarchical clustering with other clustering methods, such as K-means and DBSCAN. Highlight their strengths and weaknesses. | |  | (d) | Difference between Overfitting and Underfitting giving suitable example to each in machine Learning. | |  |  | **[4 x 5= 20]** | |  | | | | **Q.3)** | **Attempt any two parts :** | | |  | (a) | Write a short note on the following  a) Recurrent Neural Networks  b) Density-based clustering | |  | (b) | What is the fundamental difference between LDA and Principal Component Analysis (PCA) in terms of dimensionality reduction and data separation? | |  | (c) | Write down the steps for k mean clustering? Consider the following Points A1(2,11), A2(2,5), A3(2,3), A4(2,8), B1(5,8), B2(7,5),C1(1,2),C2(4,9). Assume initial centroid as A1, B1 and C1. Calculate Euclidean distance and find out the new centroid of each cluster. | |  |  | **[2 x 10= 20]** | |  | | | | **Q.4)** | **Attempt any two parts :** | | |  | (a) | Discuss the advantages and disadvantages of different types of regression algorithms, such as Linear Regression, Ridge Regression, and Lasso Regression. When should each be used in practice? | |  | (b) | Solve the question using multiple linear regressions using two independent variables.   |  |  |  | | --- | --- | --- | | X1 | X2 | Y | | 1 | 4 | 1 | | 2 | 5 | 6 | | 3 | 8 | 8 | | 4 | 2 | 12 | | |  | (c) | Write down the steps of support vector machine? Describe the significance of support vectors and margin .Explain the decision tree algorithm with the help of suitable example. | |  |  | **[2 x 10= 20]** | |  | | | | **Q.5)** | **Attempt any two parts :** | | |  | (a) | Given the data in the table reduce the dimension 2 to1 using PCA and calculate the Eigen vector.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Features | Example1 | Example2 | Example3 | Example4 | | Z1 | 4 | 8 | 13 | 7 | | Z2 | 11 | 4 | 5 | 14 | | |  | (b) | Describe the role of neural networks in deep learning. What is the architecture of a typical neural network? | |  | (c) | Explain the process of classifying a new data point using k-NN. Include the steps involved and the decision-making criteria. | |  |  | **[2 x 10= 20]** | | -----END OF PAPER ---- | | | | |